WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

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* TRANSISTORIZED BUILDING BLOCKS

The National Bureau of Standards has developed a number of modular transistorized building blocks for use in automatizing many data recording and preliminary processing tasks. Approximately 2000 such packages have been supplied by contractors at an average cost, including testing, of $30.

General Applications -- The Bureau reports that these versatile building blocks can be connected together systematically to form digital circuits that accept raw data from experimental equipment and transpose these data into a form suitable for input to a high speed electronic computer.

Blocks can be used where:

✓ Data are produced in large volumes.
✓ Data taking is extremely fast, extremely slow or extremely precise.
✓ A need exists to minimize human error, tedium and eyestrain.
✓ Computation is extensive.

Tailored to Fit -- Each assembly of packages can be tailored to fit the special requirements of the project, and can be used at the site of the experiment.

Output from the system can be:

✓ Fed directly to a computer.
✓ Recorded on a medium such as paper or magnetic tape suitable for computer input at a later date.
✓ Used to drive display equipment that keeps the scientist informed of the progress of his experiment.

Packages -- Each package is constructed on a 4" x 5" plug-in printed board and uses electronic components that are common stock items to avoid replacement problems. In most of the packages some components or subassemblies are left unconnected and must be wired externally to the package. Connecting these components externally is said to allow greater flexibility.

One package was developed for each of the most frequently used circuits. They are: flip-flop; and-or inverter; trigger or gating circuits for the flip-flop; "one-shot" pulse generator, and analog switch.

Engineering Applications -- Some applications, drawn from the Bureau's experience, include: nucleonic instrumentation needs, such as preparation of printed copy and punched paper tape from pulse-height analyzers and scalers; logical control and decoding for a high speed printer; control and logical functions of a rapid film reader; reading and decoding punched-paper tape to control an x-y plotter; preparing punched-paper tape and printed copy for measuring characteristics of transistors.

(Complete details available --- See Publication Checklist)

* SUPERSONIC AIRCRAFT

The Air Force is enthusiastically backing Administration plans which are expected to lead to large-scale Government financing for development of a supersonic transport. The program may be included in the Budget which President Eisenhower presents to Congress before retiring from office early next year.

However, General Thomas D. White, Air Force Chief of Staff, has moved to knock down speculation that "the first of these commercial aircraft must be a modified B-70" -- the bomber currently under development by North American Aviation and a number of subcontractors.

* COMMUNICATION SATELLITES

The Air Force announced this past week that it has a "passive communications satellite program" at L. G. Hanscom Field, Bedford, Mass. -- and then quickly backtracked from this statement. A "correction" to the original announcement specified that only an "applied research" program is underway and that "results will be made available to all interested U. S. Agencies."

The "correction" was apparently the result of pressure from above, since the civilian space agency, NASA, is supposed to control passive communication satellite work for peaceful purposes while the Army develops active repeater satellites for military applications. The Air Force announcement of its own program cast aspersions on both the NASA and Army systems.

The Air Force satellite is covered with radio frequency lenses mounted over spherical reflectors. The lenses focus the radio frequency energy at a point on the reflector,and again focus the reflected energy into a beam encompassing the earth.

* PLASTIC FOAM SPACE STRUCTURES: Air Force studies are said to indicate that polyurethane foams have potential structural applications in space environments.

"Man, arriving on another planet with a compact, lightweight kit, could erect a shelter made of the foam (and) could also fabricate internal furnishings in a matter of minutes," the Air Force states. This would presumably eliminate the need to transport bulky desks, beds, chairs, laboratory benches and storage compartments. The foam alone would probably be unable to stand the pressure of sitting, sleeping and work loads on earth, but would be expected to hold up well in the reduced gravity of space.

Experimental Results -- In one series of tests a polyethylene jar containing prepolymer resin was placed within a medium-sized laboratory bell jar. The jar was then evacuated to 3.5mm mercury and a catalyst -- trimethylamine adsorbed in a silica gel -- was added through a tube into the prepolymer resin. The materials then were stirred for about 30 seconds -- until a foam reaction began.

Water, necessary for carbon dioxide generation, was also adsorbed on the silica gel. The advantage of the silica gel catalyst mixture technique is said to be the release of necessary ingredients at a controlled rate. Experiments showed that if the carbon dioxide was generated at too rapid a rate, the foam would collapse before the plastic could cure sufficiently to maintain a cellular structure.

Applications -- The Air Force states that efficient foam production at low pressure environments could make it possible not only for man to build a plastic space shelter and equipment in a short time, but also would provide a means of rigidifying weather and communications satellite balloons, such as Echo I.

(R&D reported by S. Allinkov, Project Engineer, Materials Central, Wright Air Development Division, Wright Patterson Air Force Base, Ohio)

* INFORMATION PROCESSING LABORATORY

The Air Force is considering establishment of a special laboratory at L. G. Hanscom Field, Bedford, Mass. for the study of basic information processing techniques related to command and control problems. The laboratory would also provide general computing capability for support of management and research activities in the Hanscom complex.

Officials expect that such a laboratory would contain at least one large digital computer with close to 10 million bit main memory capacity and three or more digital computers of the order of 1 million bit memory capacity. It is expected that the Laboratory could begin to operate by October 1, 1962.

(Informal technical proposals and informative pricing information should be forwarded by December 23, 1960 to Directorate of Procurement, AF Command and Control Development Division, ATTN: CCKS, L. G. Hanscom Field, Bedford, Mass.

Additional technical information on this program is available from the Data Control Branch Program Evaluation Division at Hanscom Field or from Air Research and Development Command Regional Offices in Los Angeles, Chicago and New York)

* FIBER OPTICS

Fiber optics may be used in a safety-surveillance system for the Air Force Dyna-Soar boost-glide vehicle. An Air Force report states that such a system would permit a pilot to visually inspect remote regions, since several areas of the glider are potential fire hazards should propellant leakage occur during flight.

"Moisture, wiring and maintenance difficulties do not induce a detection system confidence which would encourage the pilot to initiate glider escape solely on the basis of a fire or overheat warning light," according to E. J. Hodapp, Jr., Wright Air Development Division.

The system under consideration is composed of a bundle of glass fibers of 0.002 inches diameter, with each fiber capable of transmitting light from the desired surveillance point to a viewing station.

"By placing several thousand units in a bundle, a picture can be transmitted from the hazard area of Dyna-Soar to the pilot's compartment. Where only the detection of flame is required, the system requires a simple type of fiber bundle construction. To obtain a picture quality image, a bundle of more fibers, which are oriented, is necessary.

"While much remains to be learned about fiber bundle performance in different environments, it is acknowledged that use of such a system will permit pilot visual appraisal of the hazard prior to his initiation of corrective action. This capability is desirable, and when the fiber bundle is utilized with a conventional temperature or surveillance detector, the pilot will respond to the temperature indication by visually viewing the area of concern."

The Dyna-Soar Engineering Office is also considering the use of this lightweight surveillance system for checking the possible presence of fire, smoke, fluid leaks or other hazards within remote parts of the system, such as the booster and transmission section.

* FEDERAL CONTRACT RESEARCH CENTERS

The National Science Foundation finds that the Federal Government paid for some $285.3 million in research and development at Federal Contract Centers managed by educational institutions during 1958. This appears to be more than double the total four years earlier. About 25 percent, or $70 million of total R&D expenditures in research centers went for basic research. Applied research and development each accounted for about 38 percent.

(Details are available in a new four page bulletin. Write Information Office, National Science Foundation, Washington 25, D. C. for Publication NSF -60-61)

TECHNICAL TRENDS

□ Naval Ordnance Laboratory, White Oak, Silver Spring, Md. will open bids December 22 on a solid state, 7 track FM magnetic tape recording system which can operate for not less than 15 minutes at altitudes of 100,000 feet. Information is available from the NOL Supply Office. √√√ U. S. Coast Guard is planning to buy 50 inflatable boats of neoprene coated nylon fabric construction. Details are available from Coast Guard Headquarters, Washington 25, D. C. √√√ Boeing Aircraft has won Air Force contracts for research on infrared sky background phenomena and infrared radiation from rocket plumes. √√√ The Atomic Energy Commission is inviting comment on proposed regulations to govern procedures by which members of the public may have their say on the safety of power reactors for electric utilities. Suggestions should be sent in triplicate to the Secretary, AEC, Washington 25, D. C. ATTN: Director, Division of Licensing and Regulation.

□ Researchers at the Los Alamos Scientific Laboratory, New Mexico, believe that the effects of solar radiation pressure on the ECHO I balloon satellite tend to confirm belief that a space vehicle could be propelled by a solar sail made of thin plastic film with vaporized aluminum. The pressure of sunlight would be used in much the same way that terrestrial sailboats use the wind. √√√ The rigidization of future Echo-type balloons is proving a much more difficult problem than was originally expected. Industrial efforts to perfect a plastic foam structure which would harden under the effects of ultraviolet radiation from the sun are reported to have run into a number of technical snags. The solution selected may be a laminated aluminum/mylar combination. √√√ All Navy cruisers and guided missile frigates and destroyers will employ Frescan, a single antenna radar providing simultaneous information in range, bearing and height on air targets. The system is in production at Hughes Aircraft, Fullerton, Calif. √√√ Bureau of Research and Development, Federal Aviation Agency, Washington 25, D. C. is undertaking the design and development of an airborne transceiver for light aircraft. A primary objective will be a production and selling cost comparable to present 90-channel general aviation equipment, while still meeting future stability, power output and channel spacing requirements. The device will provide a pilot with all 360 channels between 118 and 136 megacycles on a fast selection basis, permitting full application and use of 50 kilocycle spacing.

□ Manufacturers interested in having their products displayed at no cost at a permanment U. S. Trade Center, London, England may obtain further information from the Office of Trade Promotion, Bureau of Foreign Commerce, U. S. Department of Commerce, Washington 25, D. C. The Federal Communications Commission has revised its list of "acceptable" television broadcast equipment. Organizations interested in seeing or duplicating this list may contact Technical Research Division, Office of the Chief Engineer, Federal Communications Commission, Washington 25, D. C. The FCC does not print copies for general distribution. √√√ The market for electron tubes and semiconductors in 10 foreign countries has been surveyed by the U. S. Department of Commerce. A copy is available at 30 cents from any Department Field Office, located in key cities. The survey covers marketing information for Australia, Canada, Japan, Netherlands, New Zealand, Spain, Nationalist China, Turkey, South Africa and Western Germany.

□ Reports on nine helium-bearing natural gases may be consulted in advance of publication at U. S. Bureau of Mines Helium Offices, 4627 Interior Building, Washington 25, D. C. at 514 Barfield Building, Amarillo, Tex. √√√ The Defense Department has released $62.9 million for the modernization of the instrumentation and data acquisition facilities on the Atlantic Missile Range. The Air Force will use the funds to fit out two large surface ships with modern instrumentation, and to install more sophisticated tracking and data acquisition equipment on C-130 aircraft.

RESEARCH CHECKLIST

□ FIRE EXTINGUISHING AGENTS: Government-sponsored studies by Dow Chemical Co., now available, indicate that Halon 1211 (Bromochlorodifluoromethane) may best satisfy requirements for an optimum vaporizing liquid agent for aircraft ground fire protection. It also is said to offer the possibility of an effective, low toxicity agent that can be used in a low-pressure fixed in-flight system. Halon 1211 is said to have a ten-fold toxicity improvement over substances presently used by the Air Force, while being slightly more effective in extinguishing ability and more stable on long-term storage.

(Complete technical report comparing these and other chemical agents available through military channels or at $2.75 through OTS, U. S. Department of Commerce, Washington 25, D. C. Ask for WADC Tech. Rept. 59-463)

□ WAX PAPER TESTS: The National Bureau of Standards has developed a simple, rapid procedure for determining the wax content of waxed paper. Time required for extraction of the wax is reduced from several hours to three minutes. No special equipment is required and carbon tetrachloride, a toxic material, need not be used. It is replaced by the less dangerous solvent 1,1,1,- trichloroethane.

(Details of Rapid Determination of Wax in Paper available upon request. Write National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)

□ TITANIUM CARBIDE CUTTING TOOLS: Advantages in the use of titanium carbide cutting tools have been determined in tests at the Long Beach (Calif.) Naval Shipyard. The studies indicate that such inserts will "definitely out-perform tungsten carbide inserts in all operations, and ceramic inserts for deep cuts." Titanium carbide inserts were found to compare favorably with ceramic inserts for finish and high-speed shallow cuts; they are described as tougher, less brittle, and more resistant to interrupted cuts. The Navy's conclusion: "Titanium carbide is highly recommended as a cutting tool because of its outstanding performance and because it is more readily available than tungsten carbide in case of a national emergency."

□ HIGH TEMPERATURE BRAZING COMPOUND: Studies for the U. S. Air Force have resulted in development of a new high-temperature brazing compound said to be capable of withstanding environments up to 1800° C. The new alloy is believed to be particularly suitable for joining porous, refractory metals such as tungsten, molybdenum, or tantalum to solid materials without infiltration of the permeable material. Development of this molybdenum brazing compound was in connection with an ion propulsion engine program. The contract called for the brazing of porous tungsten ionization buttons to a molybdenum surface. Potential application are a so said to include high temperature joints in refractory materials, thermionic converters, and electronic components.

(R&D for Wright Air Development Division, U. S. Air Force, reported by Electro-Optical Systems, Inc., Pasadena, Calif.)

□ SEMICONDUCTOR FILMS: The Jet Propulsion Laboratory, Pasadena, California is attempting to develop a technique which may produce single-crystalline semiconductor films on various supporting materials. It is believed that his can be done without benefit of epitaxial growth, which has the disadvantage of restricting the choice of supporting materials. The JPL studies employ a finely focused electron beam that is capable of locally melting a microscopic region of a previously prepared semiconductor film. It is anticipated that self-seeding will initiate single crystalline growth.

PUBLICATION CHECKLIST

- ☐ SATELLITE CLOUD DETERMINATION, an illustrated report detailing the means by which the Weather Bureau and other Government agencies transmit satellite cloud data along national facsimile circuits. The system is based largely on experience with Tiros I. 25 Pages. Single Copies Free. (Write Information Office, U. S. Weather Bureau, Washington 25, D. C. for Forecast Development Report No. I. "Depiction of Satellite Cloud Observations.")

- ☐ UMDH SAFETY, a description of Government and industrial investigations of the flammability and explosibility of unsymmetrical dimethylhydrazine to evaluate hazards in use as a missile fuel. 12 Pages. Single Copies Free. (Write Publication Distribution Office, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigation No. 5635)

- ☐ FATIGUE OF METALS AND STRUCTURES, a 1960 revision of a Defense Department volume prepared for the designer or engineer with some knowledge of, but limited practical experience in, fatigue problems. Provides a summary of present-day information as well as references to published literature where more detailed information may be found. 399 Pages. $1.75. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication No. D 217.2:m 56)

- ☐ ATMOSPHERIC RADIO NOISE, a brief study covering such topics as the measurement of amplitude-probability distributions for atmospheric noise, definitions of parameters and statistical moments. 22 Pages. 20 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication 8BB)

- ☐ SCIENTIFIC AND TECHNICAL PERSONNEL IN AMERICAN INDUSTRY, a newly-released report on the numbers of scientists and engineers in major industries by size of company, occupation, and by type of activity such as research and development. 45 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication NSF 60-62)

- ☐ ELECTRIC POWER EQUIPMENT SURVEY, a European report on plant development in the electricity supply industry and its technical characteristics, as well as delivery trends, orders placed and production capacity in manufacturing heavy equipment for power stations. 132 Pages. $1.50.

- ☐ POLICY PLANNING FOR SPACE TELECOMMUNICATIONS, a detailed, excellent staff report by the Senate committee headed by Vice-president-elect Lyndon Johnson covering communications satellites, frequency allocations, military and civilian telecommunication programs. 207 Pages. (Write Committee on Aeronautical and Space Sciences, U. S. Senate, Washington 25, D. C.)

- ☐ SNOW AND ICE CONTROL, a report by the National Research Council on snow and ice control with chemicals and abrasives. 30 Pages. 80 cents. (Write Publications Office, National Academy of Sciences, 2101 Constitution Avenue, Northwest, Washington 25, D. C. for Highway Research Board Bulletin 252)

- ☐ ELECTRIC UTILITIES, the latest edition of an annual report presenting comprehensive financial and operating information on 269 privately owned electric utilities in the United States. $2.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for "Statistics of Electric Utilities in the United States, 1959")

- ☐ TRANSISTORIZED BUILDING BLOCKS FOR DATA INSTRUMENTATION, a detailed report on modular transistorized digital circuits used in automatizing data recording and preliminary processing tasks. Contains complete illustrations of etched-circuit layouts for various types of packages. 73 Pages. $2. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for NBS Technical Note No. 68)

* DEPARTMENT OF THE AIR FORCE

The Air Force Research program is centered in the Air Research and Development Command.

DEVELOPMENT DIVISIONS

ARDC has four major ARDC field elements: The Air Force Ballistic Missile Division (AFBMD), Inglewood, California; The Wright Air Development Division (WADD), Wright-Patterson AFB, Ohio (absorbing the Wright Air Development Center); The Air Force Command and Control Development Division (AFCCDD), L. G. Hanscom Field, Bedford, Massachusetts (absorbing the Air Force Cambridge Research Center); and the Air Force Research Division (AFRD), Washington, D. C. (absorbing the Air Force Office of Scientific Research).

These Divisions provide program direction within their respective areas. They have close relationship with major air commands and with Air Force contractors to bring about program integration and compress the time cycle for the development and test of weapon systems.

AFBMD is primarily involved in the area of ballistic missile and space program direction. WADD is responsible for program direction of military aerospace systems, including aircraft, aerodynamic missiles, missiles associated with aircraft, and manned aerospace systems and support systems. AFCCDD is mainly concerned with the program direction of all Air Force communications and electronic control systems. AFRD has responsibility for the management of the basic research program.

CENTERS

The ARDC operating Centers, grouped functionally within the Divisions, perform research and development, test, engineering services, and monitor research and development contracts with other agencies. The Centers function in the following specific areas:

AIR FORCE MISSILE TEST CENTER
Patrick AFB, Florida

Telephone: ULysses 7-6151

Contractor Relations & Sources:
C. W. Corcoran
Small Business Specialist: C. W. Corcoran
Mail Symbol: MTKSA

Interests - Operate Atlantic Missile Range: and Range support for missile and space programs.

AIR FORCE FLIGHT TEST CENTER
Edwards Air Force Base, Calif.

Telephone: CLifford 8-2111

Contractor Relations & Sources:
H. E. Griffin Ext. 29431
Small Business Specialist:
G. M. Holmes Ext. 24371

Interests - Aircraft Category II Tests; Captive missile systems and subsystems evaluation; and Flight evaluation of research vehicles.

AIR FORCE SPECIAL WEAPONS CENTER
Kirtland Air Force Base, N. M.

Telephone: CHapel 7-1711

Contractor Relations & Sources:
F. Stewart Ext. 3966
Small Business Specialist:
M. H. Nickerson Ext. 3966

Interests - Nuclear energy research, development, engineering support, and testing to include nuclear weapon systems, nuclear power applications, associated phenomena and environment.

DEVELOPMENT DIVISIONS -- CENTERS (continued)

ARNOLD ENGINEERING DEVELOPMENT CENTER
Arnold Air Force Station, Tenn.
Telephone: GL 5-2611

Contractor Relations & Sources:
M/Sgt R. Fillis Ext. 272
Small Business Specialist:
M/Sgt R. Fillis Ext. 272

Interests - Gas dynamics and propulsion research, development, and test.

AIR FORCE MISSILE DEVELOPMENT Center
Holloman AFB, New Mexico
Telephone: GRanite 3-6511

Contractor Relations & Sources:
D. P. Hathcock Ext. 6761
Small Business Specialist:
D. P. Hathcock Ext. 6761

Interests - Execute AF responsibilities incident to White Sands Missile Range; Air-to-air missiles and drone Category II tests; Operate inertial guidance test facility; and Probe operations.

AIR PROVING GROUND CENTER
Eglin AFB, Florida
Telephone: EGlin 2231

Contractor Relations & Sources:
J. V. Leftwich Ext. 4103
Small Business Specialist:
J. V. Leftwich Ext. 4103

Interests - Atmospheric and space probe operations; Test and integration of interceptor aircraft into operational environment; and Test electronic systems and subsystems, munitions, and targets.

ROME AIR DEVELOPMENT CENTER
Griffiss AFB, New York
Telephone: ROme 3200

Contractor Relations & Sources:
John Vella Ext. 5220
Small Business Specialist:
John Vella Ext. 5220

Interests - Intelligence Devices; Ground communications devices; Ground environment of surveillance, approach and landing, navigation, and electromagnetic radiation warfare.

WRIGHT AIR DEVELOPMENT DIVISION
Wright-Patterson AFB, Ohio
Telephone: CLearwater 3-7111

Contractor Relations & Sources:
Miss Betty J. Weisbrod Ext. 39250
Small Business Specialist:
Larry Grier Ext. 38216

Interests - Guidance systems; Flight Control; Propellers and rotors; Testing; Power plants; Ground Equipment; Ground equipment (aerial reconnaissance); Airborne equipment; Aero medical equipment; Human factors research; Airborne electronics equipment; Materials; Aeronautical sciences research in chemistry-mathematics-physics-fluid dynamics-mechanics-system dynamics; and Aerodynamics.

SAN ANTONIO RESEARCH AND DEVELOPMENT PROCUREMENT OFFICE
P.O. Box 63, Lackland AFB, Texas
Telephone: WAlnut 3-3411

Contractor Relations & Sources:
Miss Winifred Bell Ext. 2113/2564
Small Business Specialist:
Miss Winifred Bell Ext. 2113/2564

Interests - Personnel resources research; Maintenance personnel research; Operator personnel research; Social science research; and Qualitative personnel requirements information.
Aero medical training; Perceptual problems of flight; Medical aspects of flying safety; Air Force preventive medicine; Medical standards in aviation; Air Force clinical medicine; Aeromedical problems of Atomic Warfare; Aviation physiology; and Air evacuation.